

NON-PUBLIC?: N  
ACCESSION #: 9210200029  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Trojan Nuclear Plant PAGE: 1 OF 5

DOCKET NUMBER: 05000344

TITLE: Manual Reactor Trip Due to Main Feedwater Pump Trip on Low  
Suction Pressure Caused by Loss of Heater Drain Tank Pump Flow  
EVENT DATE: 09/13/92 LER #: 92-028-00 REPORT DATE: 10/13/92

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 60

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Margaret Megehee, Compliance Engineer TELEPHONE: (503) 556-5540

COMPONENT FAILURE DESCRIPTION:  
CAUSE: N/A SYSTEM: COMPONENT: MANUFACTURER:  
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On September 13, 1992, at 1934 hours, the reactor was manually tripped after the operating Main Feedwater Pump tripped. The Main Feedwater Pump tripped on low suction pressure which was caused by the Heater Drain Tank pump discharge valves going closed on low Heater Drain Tank level and the inability of the one operating Condensate Pump to provide adequate suction to the Main Feedwater Pump. Because the Heater Drain Tank level sightglass was erroneously providing an indication of high Heater Drain Tank level, the plant operators increased flow from the Heater Drain Tanks to the Main Condenser, which ultimately resulted in low Heater Drain Tank level. Plant response was normal with the exception of a letdown isolation on low pressurizer level. This occurred because of a Reactor Coolant System cooldown. The minimum temperature was approximately 542 degrees Fahrenheit.

Several factors contributed to this event, including a lack of direct,

reliable level indicators and alarms; incomplete understanding of the level control system; inadequate verbal communications; and a lack of procedural guidance. Corrective actions include revising procedures to provide additional guidance, conducting training, and evaluating indication adequacy and alarm/control circuitry setpoint changes.

END OF ABSTRACT

TEXT PAGE 2 OF 5

## INTRODUCTION

On September 13, 1992, the reactor AB-RCT! was manually tripped from 60 percent rated thermal power when the one operating Main Feedwater Pump SJ-P! tripped on low suction pressure. The required Engineered Safety Features equipment responded properly. This event is being reported pursuant to 10 CFR 50.73 (a) (2) (iv) as an event that resulted in manual actuation of an Engineered Safety Feature.

## DESCRIPTION OF EVENT

On September 13, 1992, at approximately 1020 hours, the plant was restarted from a reactor trip which occurred on September 12 (see Licensee Event Report 92-027). One of the two Condensate Pumps KD-P! was out of service, and Off Normal Instructions, ONI-22, "Loss of One Condensate Pump" and ONI-39, "Unit Load Limitations", limit power to 70 percent under these conditions. During the power escalation, the plant operators were manually controlling Heater Drain Tank SN-TK! level. Numerous Heater Drain Tank high level alarms were received during the power escalation, and the operators were repositioning valve CO-198, Heater Drain Tank High Level Dump Valve Manual Bypass SN-V!, to maintain level in the normal band.

At approximately 1742 hours, reactor power was stabilized at 60 percent rated thermal power, with one Main Feedwater Pump and one Condensate Pump in service. At 1832 hours, a Heater Drain Tank high level alarm actuated in the Control Room. A Turbine Building Auxiliary Operator was directed to monitor Heater Drain Tank level. The Turbine Building Auxiliary Operator discovered that the 'B' Heater Drain Tank sightglass was full. (The 'A' Heater Drain Tank sightglass was isolated for maintenance.) The Turbine Building Auxiliary Operator was instructed by Control Room personnel to throttle open CO-198. A shift turnover was then conducted. A different operator was dispatched to cycle the isolation valves for the 'B' Heater Drain Tank level sight glass to ensure the sight glass check valves were unseated. At approximately 1846 hours, the Heater Drain Tank high level alarm cleared. When the Turbine Auxiliary Operator checked

the level again, approximately 10 minutes later, the sightglass still indicated full. The Turbine Auxiliary Operator then opened CO-198 farther.

This action caused actual level in the Heater Drain Tank to decrease more rapidly. As level continued to decrease, the Heater Drain Tank discharge valves started to go closed, reducing the suction pressure available to the Main Feedwater Pump SJ-P!. At 1934 hours, a Heater Drain Tank Pump Discharge Minimum Flow alarm occurred in the Control Room, indicating that the Heater Drain Tank Pump recirculation valve had opened. Approximately 5 seconds later, the Main Feedwater Pump tripped due to low suction pressure. As per

TEXT PAGE 3 OF 5

design, the Auxiliary Feedwater Pumps BA-P! started due to the loss of both Main Feedwater Pumps. Recognizing that the Main Feedwater Pump had tripped, the Shift Manager ordered a manual reactor trip. The reactor was tripped, prior to the occurrence of an automatic trip signal.

The plant operators performed the immediate actions of EI-0, "Reactor Trip, Safety Injection and Diagnosis" and then transitioned to ES-0.1, "Reactor Trip Response" at 1937 hours. At 1950 hours, a letdown isolation occurred due to pressurizer AB-PZR! level reaching 17 percent.

The operators started the 'B' Centrifugal Charging Pump BQ-P! to help restore pressurizer level. The level was restored to greater than 17 percent, and the 'B' Centrifugal charging Pump was secured at 1958 hours.

Letdown was re-established at 2015 hours. The safety-related Auxiliary Feedwater Pumps were secured by 2036 hours, and feedwater was being supplied to the Steam Generators by the electric, non-safety-related Auxiliary Feedwater Pump.

## CAUSE OF EVENT

Following this event, functional checks of the Heater Drain Tank high level dump valve, level controllers, and hi-hi alarm level switches were performed. Calibration checks of the high and low Heater Drain Tank level alarm switches were done. Calibration checks were also done on the pressure switches for the Main Feedwater Pump low suction pressure alarm and low suction pressure pump trip. These checks showed that the instrumentation was functioning properly.

This event was caused by the inappropriate action of leaving CO-198 open, allowing Heater Drain Tank level to decrease and the Heater Drain Tank

Pumps to go on recirculation flow. During startup and low power level conditions, CO-198 is routinely throttled open to maintain Heater Drain Tank level in the normal band as allowed by the system operating procedure. Sightglasses provide the only direct indication of Heater Drain Tank levels. At the time of this event, the sightglass for the 'A' Heater Drain Tank level was out of service, and plant operators were relying on the indication from the 'B' Heater Drain Tank sightglass. The sightglasses occasionally provide erroneous readings because the ball check valves that isolate the sightglass have a tendency to shut when system pressure transients occur. Therefore, prior to the reactor trip, an operator had cycled the isolation valves to ensure the ball checks were not stuck shut. However, level indication did not change after this action. (Therefore, it is believed that the ball checks remained seated after the isolation valves were cycled, and the erroneous indication continued.)

When the level was checked later, the sightglass still indicated that Heater Drain Tank level was high. The Turbine Auxiliary

TEXT PAGE 4 OF 5

Operator opened CO-198 further.

Several other factors contributed to this event. The design of the alarm and control system was not well understood by the operating crew. After the Heater Drain Tank high level alarm was received, the operators checked the position of the high level dump valve CV-2754. The valve was found to be in the closed position. The operators suspected that the valve was not operating properly. This led to further reliance on CO-198.

Inadequate verbal communications was identified as another contributing factor. The Control Operator was not notified when the Turbine Auxiliary Operator opened CO-198 farther approximately fifteen minutes prior to the trip. Had the communication occurred, the fact that the sightglass indication was in error may have been recognized.

Inadequate written guidance was also identified as a contributing factor.

The procedures in effect limited power to 70 percent with one Condensate Pump out of service. Following this event, it was determined that with the existing Heater Drain Tank alarm and indication limitations that power should be limited to approximately 52 percent to ensure that loss of Heater Drain Tank flow does not cause a plant trip. In addition, procedures directed operation of CO-198 before allowing the automatic

operation of the high level dump valve to control level.

Analysis of the event identified the fact that on decreasing Heater Drain Tank level, the control valves can throttle down, and the Heater Drain Tank pumps go on recirculation before the tank low level alarm setpoint is reached. In addition, the Main Feedwater Pump low suction pressure alarm setpoint was set at approximately the same value as the low suction pressure trip setpoint. Consequently, neither the low Heater Drain Tank level alarm nor the Main Feedwater Pump low suction pressure alarm alerted the operators to the impending loss of feedwater.

#### CORRECTIVE ACTIONS

1. Operations Management issued Night Orders to alert operating crews to the cause of the reactor trip, to provide a brief explanation of the Heater Drain Tank control system setpoint relationships, and to clarify that CO-198 should only be operated when high-high level exists in the Heater Drain Tanks.

2. An engineering evaluation was completed to provide guidance for plant power limitations to ensure a loss of Heater Drain flow would not cause a low suction pressure trip of a main Feedwater Pump.

#### TEXT PAGE 5 OF 5

3. The plant computer alarm setpoint for Main Feedwater Pump low suction pressure was raised to ensure the alarm occurred prior to the low suction pressure trip.

4 The level sightglass for the 'A' Heater Drain Tank was returned to service.

5 The applicable operating procedures will be revised by February 18, 1993 to specify the maximum power level allowed with one Condensate Pump out of service and to provide guidance on operation of CO-198.

6 The control and alarm system for the Heater Drain Tanks will be evaluated for needed enhancements. This will include an evaluation of raising the Heater Drain Tank low level alarm to ensure the alarm occurs prior to the Heater Drain Pumps going on recirculation. This will be completed by February 26, 1993.

7. The ball check valve sticking problem on the gauge glass and the overall adequacy of Heater Drain Tank level indication will be evaluated by November 22, 1992.

8. Training on this event will be provided to licensed and non-licensed operators. This training will include a review of Heater Drain System operation and is scheduled for completion on January 21, 1993.

#### SAFETY CONSEQUENCES AND IMPLICATIONS

This event had no safety consequences or implications. The Engineered Safety Features Actuation System functioned properly in response to the loss of main feedwater by starting the Auxiliary Feedwater Pumps. Plant response to the manual reactor trip was normal with the exception of the letdown isolation on low pressurizer level. The decrease in pressurizer level was caused by cooldown of the Reactor Coolant System ("shrink"). During the transient, the Reactor Coolant System average temperature reached a minimum of 542 degrees Fahrenheit and the minimum pressurizer pressure was 2060 psig.

#### ADDITIONAL INFORMATION

There have been no recent Engineered Safety Features Actuations related to the Heater Drain System.

ATTACHMENT 1 TO 9210200029 PAGE 1 OF 1

PGE

Portland General Electric Company  
Trojan Nuclear Plant  
71760 Columbia River Hwy.  
Rainier, Oregon 97048  
(503) 556-3713 October 13, 1992  
RDM-522-92

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington DC 20555

Gentlemen:

Licensee Event Report No. 92-028 is attached. This report discusses a manual reactor trip which was initiated in response to a Main Feedwater Pump trip on low suction pressure when Heater Drain Tank level was allowed to get too low.

Sincerely,

R. D. Machon  
General Manager  
Trojan Nuclear Plant

c: Mr. John B. Martin  
Regional Administrator, Region V  
U.S. Nuclear Regulatory Commission

Mr. David Stewart-Smith  
State of Oregon  
Department of Energy

Mr. R. C. Barr  
USNRC Resident Inspector  
Trojan Nuclear Plant

LER Distribution

\*\*\* END OF DOCUMENT \*\*\*

---